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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/016,633	10/30/2001	Martin Peiter	SC0142WD	4073
23125	7590	10/27/2004		
FREESCALE SEMICONDUCTOR, INC. LAW DEPARTMENT 7700 WEST PARMER LANE MD:TX32/PL02 AUSTIN, TX 78729				
			EXAMINER TRAN, BINH X	
			ART UNIT 1765	PAPER NUMBER

DATE MAILED: 10/27/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/016,633

Applicant(s)

PEITER ET AL.

Examiner

Binh X Tran

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM  
THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 22 July 2004.  
2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-10 and 12-30 is/are pending in the application.  
4a) Of the above claim(s) 18-27 is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 1-10, 12-17, 28-30 is/are rejected.  
7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
8) ☒ Claim(s) 1-10 and 12-30 are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.  
10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)  
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_  
4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_  
5) ☐ Notice of Informal Patent Application (PTO-152)  
6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Claim Interpretations*

1. In claim 1, applicants amend to include a new limitation "separating the area of the wafer receiving the first radiation pulse from the rest of the wafer with a shield" (emphasis added). The examiner cannot find the term "shield" in the applicant's specification. However, the applicants clearly disclose a sacrificial layer or resist can be used as a mask (Fig 3C). Thus, the examiner will interpret that the sacrificial layer or resist layer is used as a shield to separate the area of the wafer receiving the first radiation pulse from the rest of the wafer.

### *Claim Rejections - 35 USC § 112*

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 15 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In line 3 of claim 15, the phrase "all holes" lack antecedent basis.

### *Claim Rejections - 35 USC § 103*

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 1-9, 13, 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al. (US 6,156,676) in view of Chen (US 6,214,703).

Sato discloses a method of laser marking comprising the step of:

directing a defined beam onto the wafer (2) by means of beam generator (i.e. laser source) to remove some wafer material from a wafer region, characterized by generating a first radiation pulse (i.e. laser radiation beam 7) having a predetermined energy density and used to create a deep pit in the wafer (i.e., laser marking region), (Fig 1B, col. 3 line 63 to col. 4 lines 10).

Sato fails to disclose the step of separating the area of the wafer receiving the first radiation pulse from the rest of the wafer with a shield. Chen teaches to form a protecting layer and exposing the pre-selected portion of the protecting layer to form windows which expose the wafer in the region to be scribed (col. 6 lines 5-10). It would have been obvious to one having ordinary skill in the art, at the time of invention, to

modify Sato in view of Chen by using the sacrificial layer because it will protect the wafer during the removing step.

Respect to claim 2, Sato fails to disclose local plasma is generated for creating the pit. However, Sato clearly discloses the step of flowing a gas over the laser marking area to enhance the removal process. In a method for create deep trench using laser marker, Chen teaches to form plasma to create the deep trench or deep pit. It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Sato in view of Chen by generating local plasma because it will enable the formation of scribe lines that are both narrow and deeply penetrated into the wafer.

Respect to claim 3, Sato discloses that laser is used as a beam generator means. Respect to claims 4-6, 8, Sato teaches to flow a gas jet of  $N_2$  toward the edge of wafer edge so that the particles generated can be removed by a vacuum pump (6) (Fig 1B, col. 4-5).

Respect to claim 7, Chen discloses using inert gas such as helium. Respect to claim 9, Sato fails to disclose that a sacrificial layer is applied on the wafer before deep pit is created, and the sacrificial layer is subsequently removed. Chen teaches to form a photoresist layer (read on "sacrificial layer") before the deep pit is created and subsequently removed. It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Sato in view of Chen by using the sacrificial layer because it will protect the substrate during the removing step.

Respect to claim 13, Chen discloses a plurality of mutually spaced deep pits is created. Respect to claims 16-17, Chen discloses the depth of the pit is within 6-8  $\mu\text{m}$  (col. 6 lines 44-45, within applicants' range).

7. Claims 10, 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato and Chen as applied to claim 1 above and further in view of Kestenbaum (US 4,044,222).

Respect to claim 10, Sato does not explicitly disclose any residual remains on the wafer are reduced or removed by subsequent evaporating step using a second radiation pulse. In a method to create apertures, Kestenbaum discloses the materials around the aperture (i.e. pit) are removed by evaporating step using plurality of radiation pulse (read on "second radiation pulse", col.5 lines 1-5, line 65-68). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Sato in view of Kestenbaum by using a second radiation pulse because it will help to remove residue and to form a tempered aperture.

Respect to claim 15, Kestenbaum teaches that the apertures are created by means of first radiation pulse and then all apertures are subjected to additional radiation pulse (Fig 1-2, col. 5 lines 65-67, col. 7 lines 15-30).

8. Claims 12, 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato and Chen as applied in claim 1 above and, further in view of Tanimoto et al. (US 5,597,590)

Respect to claim 12, Sato fails to disclose a second radiation pulse is generated has a lower energy density compared to the first radiation pulse. Tanimoto teaches to

adjust the energy density of the beam through out the removal process so that only the desire portion of the film will be removed (col. 25-26). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Sato and Chen in view of Tanimoto by adjusting energy density to a lower level comparing with the initial level because this would control the selectivity of the removal process. Further, Tanimoto teaches energy density is a result effective variable. The result effective variable is commonly determined by routine experiment. The process of conducting routine experiments so as to produce an expected result is obvious to one of ordinary skill in the art.

Respect to claim 14, Tanimoto teaches to create a pitch using plurality of laser pulse before the creation of another pit.

9. Claims 28-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato in view of Smart et al. (US 6,340,806).

Claim 28 differs from Sato by further disclosing that the second power of the second radiation is different than the first power used to create a deep pit. In a semiconductor process, Smart teaches using a plurality of laser pulse to create a pattern on the wafer. Smart further teaches to use different power level for each radiation pulse (Fig 1c). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Sato in view of Smart by using different power level because this technique allow more control for material removal process.

Respect to claim 29, Smart teaches the second radiation beam smoothes the edge of the pitch (col. 22 lines 13-16). Respect to claim 30, Smart teaches the first and the second radiation beam is at least a pulse (Fig 3a).

***Response to Arguments***

10. Applicant's arguments with respect to claims 1-10, 12-17, 28-30 have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Binh X Tran whose telephone number is (571) 272-

1469. The examiner can normally be reached on Monday-Thursday and every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine G. Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Binh X. Tran

**NADINE G. NORTON**  
**SUPERVISORY PATENT EXAMINER**

